What is claimed is:

1. An optical communication system comprising:

an N x N wavelength path establishment circuit having N input ports and N output ports, N being an integer of at least 2, outputting light input from an input port to a different output port depending on the wavelength of the input light, and the wavelength of light output from an output port being different depending on the input port;

n communication nodes, n being an integer at least 2 and not greater than N, for outputting information of an input optical data signal, as is or after changing a part of the information, as an optical data signal of a predetermined wavelength; and

optical waveguides for connecting the input ports and the output ports of the N x N wavelength path establishment circuit, and the communication nodes,

wherein for at least some of the n communication nodes, in order to form at least one logical-ring transmission path where an optical data signal transmitted from one communication node returns to the one communication node via other communication nodes, a correlation of wavelengths for connecting between the input ports and the output ports of the N x N wavelength path establishment circuit, wavelengths of optical data signals output from the respective communication nodes, and connections between the input ports and the output ports of the N x N wavelength path establishment circuit, and the respective communication nodes are set.

2. An optical communication system according to claim 1, wherein for at least some of the n communication nodes, in order to form at least two logical-ring transmission paths where an optical data signal transmitted from one communication node returns to the one communication node via other communication nodes, a

correlation of wavelengths for connecting between the input ports and the output ports of the N x N wavelength path establishment circuit, wavelengths of at least two optical data signals output from the respective communication nodes, and connections between the input ports and the output ports of the N x N wavelength path establishment circuit, and the respective communication nodes are set.

3. An optical communication system according to claim 2, wherein each communication nodes is provided with:

a device which transfers the optical data signal so that an optical data signal loaded with information of communication nodes circulates the respective communication nodes forming the logical-ring transmission path;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the optical data signal to the memory, and appends information to the optical data signal which is transmitted.

4. An optical communication system according to claim 3, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the

optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

5. An optical communication system according to claim 2, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

6. An optical communication system according to claim 1, wherein each communication node sets the wavelength of an optical control signal for link query between the communication nodes which is output so as to form the logical-ring transmission path where the optical control signal circulates in reverse to the optical data signal.

7. An optical communication system according to claim 6, wherein each communication node splits a part of an input optical data signal and transmits the split optical data signal as the optical control signal for link query.

8. An optical communication system according to claim 7, wherein a communication node which cannot receive the optical control signal for link query sets the output wavelength of the optical data signal to a wavelength corresponding to a communication node which skips at least the next communication node on the transmission path of the optical data signal.

9. An optical communication system according to claim 8, wherein each communication nodes is provided with:

a device which transfers the optical data signal so that an optical data signal loaded with information of communication nodes circulates the respective communication nodes forming the logical-ring transmission path;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the optical data signal to the memory, and appends information to the optical data signal which is transmitted.

10. An optical communication system according to claim 9, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the

optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

11. An optical communication system according to claim 8, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

12. An optical communication system according to claim 7, wherein each communication nodes is provided with:

a device which transfers the optical data signal so that an optical data signal loaded with information of communication nodes circulates the respective communication nodes forming the logical-ring transmission path;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the optical data signal to the memory, and appends information to the optical data signal which is transmitted.

13. An optical communication system according to claim 12, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

14. An optical communication system according to claim 7, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

15. An optical communication system according to claim 6, wherein each communication node configures a leading part of the optical data signal with an unmodulated signal, modulates the unmodulated part of the optical data signal input to

each communication node, and transmits the modulated optical data signal as the optical control signal for link query.

16. An optical communication system according to claim 15, wherein a communication node which cannot receive the optical control signal for link query sets the output wavelength of the optical data signal to a wavelength corresponding to a communication node which skips at least the next communication node on the transmission path of the optical data signal.

17. An optical communication system according to claim 16, wherein each communication nodes is provided with:

a device which transfers the optical data signal so that an optical data signal loaded with information of communication nodes circulates the respective communication nodes forming the logical-ring transmission path;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the optical data signal to the memory, and appends information to the optical data signal which is transmitted.

18. An optical communication system according to claim 17, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or

the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

19. An optical communication system according to claim 16, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

20. An optical communication system according to claim 15, wherein each communication nodes is provided with:

a device which transfers the optical data signal so that an optical data signal loaded with information of communication nodes circulates the respective communication nodes forming the logical-ring transmission path;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the optical data signal to the memory, and appends information to the optical data signal which is transmitted.

21. An optical communication system according to claim 20, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

22. An optical communication system according to claim 15, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

23. An optical communication system according to claim 6, wherein a communication node which cannot receive the optical control signal for link query sets

the output wavelength of the optical data signal to a wavelength corresponding to a communication node which skips at least the next communication node on the transmission path of the optical data signal.

24. An optical communication system according to claim 23, wherein each communication nodes is provided with:

a device which transfers the optical data signal so that an optical data signal loaded with information of communication nodes circulates the respective communication nodes forming the logical-ring transmission path;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the optical data signal to the memory, and appends information to the optical data signal which is transmitted.

25. An optical communication system according to claim 24, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

26. An optical communication system according to claim 23, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

27. An optical communication system according to claim 6, wherein each communication nodes is provided with:

a device which transfers the optical data signal so that an optical data signal loaded with information of communication nodes circulates the respective communication nodes forming the logical-ring transmission path;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the optical data signal to the memory, and appends information to the optical data signal which is transmitted.

28. An optical communication system according to claim 27, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

29. An optical communication system according to claim 6, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

30. An optical communication system according to claim 1, wherein each communication nodes is provided with:

a device which transfers the optical data signal so that an optical data signal loaded with information of communication nodes circulates the respective communication nodes forming the logical-ring transmission path;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the optical data signal to the memory, and appends information to the optical data signal which is transmitted.

31. An optical communication system according to claim 30, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

32. An optical communication system according to claim 1, further comprising a management device which monitors and controls the condition of the respective communication nodes,

wherein a management signal for managing a communication node is: transferred between the management device and the communication node by an optical signal, of which wavelength is different from the wavelength of the optical data signal or the wavelengths of the optical data signal and the optical control signal; transferred via an optical waveguide which is different from an optical waveguide for transmitting the

optical data signal or both the optical data signal and the optical control signal; or transferred via an electric signal.

33. An optical communication system for communicating between multiple communication nodes for outputting information of an input optical data signal, as is or after changing a part of the information, as an optical data signal of a predetermined wavelength, comprising:

an N x N wavelength path establishment circuit, which has N input ports and N output ports, N being any integer which satisfies $2 \leq n \leq N$ where n is the number of the communication nodes, connected to the communication nodes via an optical waveguide, and light input from an input port is output to a different output port depending on the wavelength of the input light, and the wavelength of light output from an output port is different depending on the input port;

a database prestored with output wavelengths used in the case in which a signal is routed from a predetermined input port to a predetermined output port in the N x N wavelength path establishment circuit; and

a controlling device which receives control information including a connection request from a communication node, refers to the database and reads out an output wavelength which should be set by the communication node, and transmits control information for instructing the output wavelength to the communication node which transmitted the connection request,

wherein for at least some of the n communication nodes, in order to form a logical-ring transmission path where an optical data signal transmitted from one communication node returns to the one communication node via other communication nodes, a correlation of wavelengths for connecting between the input ports and the output

ports of the N x N wavelength path establishment circuit, wavelengths of optical data signals output from respective communication nodes, and connections between the input ports and the output ports of the N x N wavelength path establishment circuit, and the respective communication nodes are set.

34. An optical communication system, comprising:

multiple communication nodes each having a pair of a signal output port and a signal input port; and

multiple path establishment circuits each having multiple optical input ports and multiple optical output ports which are set so that an optical signal input from an optical input port is output to a predetermined optical output port corresponding to the wavelength of the input optical signal,

wherein the signal output port and the signal input port of the pair of each communication node are connected to an optical input port and an optical output port of one of the multiple path establishment circuits, an optical input port of one path establishment circuit is connected to an optical output port of another path establishment circuit, and an optical output port of the one path establishment circuit is connected to an optical input port of the other path establishment circuit.

35. An optical communication system according to claim 34, wherein the wavelengths of the optical signals from the signal output ports of the respective communication nodes are arranged so that the connection of the multiple communication nodes forms a logical ring topology.

36. An optical communication system according to claim 35, wherein an optical output port of the one path establishment circuit and an optical input port of the other path establishment circuit is connected via a communication node.

37. An optical communication system according to claim 36, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

38. An optical communication system according to claim 37, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

39. An optical communication system according to claim 36, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

40. An optical communication system according to claim 35, wherein each communication node is provided with:

a device which transfers an optical data signal loaded with information of communication nodes so that the optical data signal circulates the respective communication nodes on the logical ring topology;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the received optical data signal to the memory, and appends information to an optical data signal which is transmitted.

41. An optical communication system according to claim 40, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

42. An optical communication system according to claim 35, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

43. An optical communication system according to claim 34, wherein an optical output port of the one path establishment circuit and an optical input port of the other path establishment circuit is connected via a communication node.

44. An optical communication system according to claim 43, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

45. An optical communication system according to claim 44, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

46. An optical communication system according to claim 43, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

47. An optical communication system according to claim 34, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

48. An optical communication system comprising multiple units, each of which comprises:

multiple communication nodes each having a pair of a signal output port and a signal input port;

multiple optical switches, each of which sets the direction of an optical signal in which the optical signal from one optical input port is output to any of multiple optical output ports;

multiple optical multiplexers, each of which multiplexes optical signals from multiple optical input ports, and each of which outputs a multiplexed signal to one optical output port; and

a path establishment circuit having multiple optical input ports and multiple optical output ports which is set so that an optical signal input from an input port is output to a predetermined optical output port depending on the wavelength of the input optical signal,

wherein, in each of the multiple units, a signal output port of a communication node is connected to an optical input port of the corresponding optical switch, an optical output port of the optical switch is connected to an optical input port of the corresponding optical multiplexer, an optical output port of the optical multiplexer is connected to an optical input port of the corresponding path establishment circuit, and an output port of the path establishment circuit is connected to a signal input port of the corresponding communication node.

49. An optical communication system according to claim 48, wherein the wavelengths of the optical signals from the signal output ports of the respective communication nodes are arranged and the directions of the optical switches are set so that the connection of the multiple communication nodes forms a logical ring topology.

50. An optical communication system according to claim 49, wherein each of the path establishment circuits comprises an arrayed waveguide grating.

51. An optical communication system according to claim 50, wherein an optical light source of the communication node comprises a wavelength-tunable optical light source.

52. An optical communication system according to claim 51, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

53. An optical communication system according to claim 52, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

54. An optical communication system according to claim 51, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

55. An optical communication system according to claim 50, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

56. An optical communication system according to claim 55, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

57. An optical communication system according to claim 50, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

58. An optical communication system according to claim 49, wherein an optical light source of the communication node comprises a wavelength-tunable optical light source.

59. An optical communication system according to claim 58, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

60. An optical communication system according to claim 59, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

61. An optical communication system according to claim 58, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

62. An optical communication system according to claim 49, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

63. An optical communication system according to claim 62, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

64. An optical communication system according to claim 49, wherein each communication node is provided with:

a device which transfers an optical data signal loaded with information of communication nodes so that the optical data signal circulates the respective communication nodes on the logical ring topology;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the received optical data signal to the memory, and appends information to an optical data signal which is transmitted.

65. An optical communication system according to claim 64, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

66. An optical communication system according to claim 49, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

67. An optical communication system according to claim 48, wherein each of the path establishment circuits comprises an arrayed waveguide grating.

68. An optical communication system according to claim 67, wherein an optical light source of the communication node comprises a wavelength-tunable optical light source.

69. An optical communication system according to claim 68, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

70. An optical communication system according to claim 69, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

71. An optical communication system according to claim 68, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

72. An optical communication system according to claim 67, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

73. An optical communication system according to claim 72, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

74. An optical communication system according to claim 67, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

75. An optical communication system according to claim 48, wherein an optical light source of the communication node comprises a wavelength-tunable optical light source.

76. An optical communication system according to claim 75, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

77. An optical communication system according to claim 76, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

78. An optical communication system according to claim 75, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

79. An optical communication system according to claim 48, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

80. An optical communication system according to claim 79, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

81. An optical communication system according to claim 48, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

82. An optical communication system comprising multiple units, each of which comprises:

multiple communication nodes each having a pair of a signal output port and a signal input port;

multiple optical splitters, each of which splits an optical signal from one optical input port, and each of which outputs split optical signals to multiple optical output ports;

multiple optical switches, each of which sets the direction of an optical signal in which the optical signal from any of multiple input ports is output to one optical output port; and

a path establishment circuit having multiple optical input ports and multiple optical output ports which is set so that an optical signal input from an optical input port is output to a predetermined optical output port depending on the wavelength of the input optical signal,

wherein, in each of the multiple units, a signal output port of a communication node is connected to an optical input port of the corresponding optical splitter, an optical output port of the optical splitter is connected to an optical input port of the corresponding optical switch, an optical output port of the optical switch is connected to an optical input port of the corresponding path establishment circuit, and an output port of the path establishment circuit is connected to a signal input port of the corresponding communication node.

83. An optical communication system according to claim 82, wherein the wavelengths of the optical signals from the signal output ports of the respective communication nodes are arranged and the directions of the optical switches are set so that the connection of the multiple communication nodes forms a logical ring topology.

84. An optical communication system according to claim 83, wherein each of the path establishment circuits comprises an arrayed waveguide grating.

85. An optical communication system according to claim 84, wherein an optical light source of the communication node comprises a wavelength-tunable optical light source.

86. An optical communication system according to claim 85, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

87. An optical communication system according to claim 86, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

88. An optical communication system according to claim 85, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

89. An optical communication system according to claim 84, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

90. An optical communication system according to claim 89, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

91. An optical communication system according to claim 84, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

92. An optical communication system according to claim 83, wherein an optical light source of the communication node comprises a wavelength-tunable optical light source.

93. An optical communication system according to claim 92, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

94. An optical communication system according to claim 93, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

95. An optical communication system according to claim 92, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

96. An optical communication system according to claim 83, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

97. An optical communication system according to claim 96, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

98. An optical communication system according to claim 83, wherein each communication node is provided with:

a device which transfers an optical data signal loaded with information of communication nodes so that the optical data signal circulates the respective communication nodes on the logical ring topology;

a memory for storing information of the optical data signal which has been received; and

a transfer device which writes the information of the received optical data signal to the memory, and appends information to an optical data signal which is transmitted.

99. An optical communication system according to claim 98, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

100. An optical communication system according to claim 83, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

101. An optical communication system according to claim 82, wherein each of the path establishment circuits comprises an arrayed waveguide grating.

102. An optical communication system according to claim 101, wherein an optical light source of the communication node comprises a wavelength-tunable optical light source.

103. An optical communication system according to claim 102, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

104. An optical communication system according to claim 103, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

105. An optical communication system according to claim 102, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

106. An optical communication system according to claim 101, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

107. An optical communication system according to claim 106, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

108. An optical communication system according to claim 101, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

109. An optical communication system according to claim 82, wherein an optical light source of the communication node comprises a wavelength-tunable optical light source.

110. An optical communication system according to claim 109, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

111. An optical communication system according to claim 110, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

112. An optical communication system according to claim 109, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

113. An optical communication system according to claim 82, wherein a part of the communication nodes is replaced by a repeater having a function for converting wavelength.

114. An optical communication system according to claim 113, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

115. An optical communication system according to claim 82, further comprising a management node which monitors and controls the condition of the respective communication nodes,

wherein the respective communication nodes and the management node communicate using an optical signal, of which the wavelength is different from the wavelength of an optical data signal loaded with information of communication nodes.

116. An optical communication system for communicating between multiple communication nodes each having a pair of a signal output port and a signal input port, comprising:

a path establishment circuit having multiple optical input ports and multiple optical output ports which is previously set so that an optical signal input from an optical input port is output to a predetermined optical output port depending on the wavelength of the input optical signal;

a database prestored with output wavelengths used in the case in which a signal is routed from a predetermined optical input port to the predetermined optical output port in the path establishment circuit; and

a controlling device which receives control information including a connection request from a communication node, refers to the database and reads out an output wavelength which should be set by the communication node, and transmits control information for instructing the output wavelength to the communication node which transmitted the connection request,

wherein the signal output port and the signal input port of the pair of each multiple communication node are connected to an optical input port and an optical output

port of the path establishment circuit, and an optical input port of one path establishment circuit is connected to an optical output port of another path establishment circuit, and an optical output port of the one path establishment circuit is connected to an optical input port of the other path establishment circuit.

117. An optical communication system for communicating between multiple communication nodes each having a pair of a signal output port and a signal input port, comprising:

multiple units, each of which comprises

multiple optical switches, each of which sets the direction of an optical signal in which the optical signal from one optical input port is output to any of multiple optical output ports,

multiple optical multiplexers, each of which multiplexes optical signals from multiple optical input ports, and each of which outputs a multiplexed optical signal to one optical output port, and

a path establishment circuit having multiple optical input ports and multiple optical output ports which is set so that an optical signal input from an optical input port is output to a predetermined optical output port depending on the wavelength of the input optical signal;

a database prestored with information of devices connected to the optical input ports and the optical output ports of the optical switches, and output wavelengths used in the case in which an optical signal is routed from a predetermined optical input port to a predetermined optical output port in the path establishment circuits; and

a controlling device which receives control information including a connection request from a communication node, refers to the database and reads out an output

wavelength which should be set by the communication node, and transmits control information for instructing the output wavelength to the communication node which transmitted the connection request, and also which controls the setting of the directions of the optical switches,

wherein, in each of the multiple units, a signal output port of a communication node is connected to an optical input port of the corresponding optical switch, an optical output port of the optical switch is connected to an optical input port of the corresponding optical multiplexer, an optical output port of the optical multiplexer is connected to an optical input port of the corresponding path establishment circuit, and an output port of the path establishment circuit is connected to a signal input port of the corresponding communication node.

118. An optical communication system for communicating between multiple communication nodes each having a pair of a signal output port and a signal input port, comprising:

multiple units, each of which comprises

multiple optical splitters, each of which splits an optical signal from one optical input port, and each of which outputs split optical signals to multiple optical output ports,

multiple optical switches, each of which sets the direction of an optical signal in which the optical signal from any of the multiple input ports is output to one optical output port, and

a path establishment circuit having multiple optical input ports and multiple optical output ports which is set so that an optical signal input from an input port is output to a predetermined optical output port depending on the wavelength of the input optical signal;

a database prestored with information of devices connected to the optical input ports and the optical output ports of the optical switches, and output wavelengths used in the case in which an optical signal is routed from a predetermined optical input port to a predetermined optical output port in the path establishment circuits; and

a controlling device which receives control information including a connection request from a communication node, refers to the database and reads out an output wavelength which should be set by the communication node, and transmits control information for instructing the output wavelength to the communication node which transmitted the connection request, and also which controls the setting of the directions of the optical switches,

wherein, in each of the multiple units, a signal output port of a communication node is connected to an optical input port of the corresponding optical splitter, an optical output port of the optical splitter is connected to an optical input port of the corresponding optical switch, an optical output port of the optical switch is connected to an optical input port of the corresponding path establishment circuits, and an output port of the path establishment circuit is connected to a signal input port of the corresponding communication node.